

What is claimed is:

1. An RF magnetic shield for use in a radiofrequency system including an RF magnetic field resonator for generating an RF magnetic field having a magnetic component and an electric component, the RF magnetic shield comprising: a dielectric layer having a plurality of conductive regions separated by non-conductive regions on each side of the dielectric layer, the conductive regions overlapping on opposite sides of the dielectric layer to form a plurality capacitive elements which are partially non-conductive at radio frequencies such that the electrical component tangent to the shield is other than zero and the magnetic component perpendicular to the shield is essentially zero.

2. An RF magnetic shield as in claim 1, wherein the conductive regions define a pattern having approximately equal capacitive impedance per unit length in at least one direction.

3. An RF magnetic shield as in claim 1, wherein the RF magnetic field coil and the shield define a sample volume, and wherein the electrical component is substantially uniform around the entire sample volume.

4. An RF magnetic shield as in claim 1, wherein a capacitive voltage is developed across the capacitive elements at radio frequencies.

5. An RF magnetic shield as in claim 4, wherein the capacitive voltage developed across the capacitive elements at radio frequencies is about one quarter of a total capacitive voltage developed at the resonant frequency.

6. An RF magnetic shield as in claim 4, wherein the conductive regions have a size and shape, and the non-conductive regions have a size and shape, and wherein the size and shape of the non-conductive and conductive regions are selected to develop the capacitive voltage across the capacitive elements at radio frequencies.

7. An RF magnetic shield as in claim 4, wherein the capacitive elements are substantially non-conductive at audio frequencies.

8. An RF magnetic shield as in claim 1, wherein the RF magnetic field coil comprises a birdcage coil, and wherein the RF magnetic shield comprises an endcap on an end of the birdcage coil.

9. An RF magnetic shield as in claim 8, wherein the shield is substantially planar and circular.

10. An RF magnetic shield as in claim 8, wherein the birdcage resonator has a plurality of rungs, and wherein a plurality of conductive regions on the shield are connected to the rungs.

11. An RF magnetic shield as in claim 8, wherein the conductive regions define a pattern having sixteen-fold symmetry.

12. An RF magnetic shield as in claim 8, wherein the pattern includes a plurality of annular regions divided into a plurality of radial segments.

13. An RF magnetic shield as in claim 8, wherein one or more of the conductive regions is used as a drive point.

14. An RF magnetic shield as in claim 1, wherein the RF magnetic field coil comprises a cylindrical body coil, and wherein the RF magnetic shield comprises a cylinder disposed about the body coil.

15. An RF magnetic shield as in claim 14, wherein the conductive regions define a pattern having four-fold symmetry.

16. An RF magnetic shield as in claim 14, wherein the conductive regions define a pattern having six-fold symmetry.

17. An RF magnetic shield as in claim 1, wherein the RF magnetic field coil comprises a surface coil, and wherein the RF magnetic shield comprises an annulus disposed about the surface coil.

18. An RF magnetic shield as in claim 17, wherein the RF magnetic field coil is substantially planar and annular.

19. An RF magnetic shield as in claim 18, wherein the RF magnetic field coil includes a hole which is sized and shaped to match the surface coil.

20. A magnetic resonance imaging (MRI) system, comprising:
an RF magnetic field coil for generating an RF magnetic field having a magnetic component and an electric component; and

an RF magnetic shield disposed adjacent the RF magnetic field coil, the RF magnetic shield being partially non-conductive at radio frequencies such that the average electrical component tangent to the shield is other than zero and the magnetic component perpendicular to the shield is essentially zero.

21. An RF magnetic shield as in claim 20, wherein the RF magnetic field coil and the shield define a sample volume, and wherein the electrical component is uniform around the entire sample volume.

22. An RF magnetic shield as in claim 20, wherein a capacitive voltage is developed across the capacitive elements at radio frequencies.

23. An RF magnetic shield as in claim 22, wherein the capacitive voltage developed across the capacitive elements at radio frequencies is about one quarter of a total capacitive voltage developed at the resonant frequency.

24. An RF magnetic shield as in claim 20, wherein the conductive regions have a size and shape, and the non-conductive regions have a size and shape, and wherein the size and shape of the non-conductive and conductive regions are selected to develop the capacitive voltage across the capacitive elements at radio frequencies.

25. An RF magnetic shield as in claim 20, wherein the capacitive elements are substantially non-conductive at audio frequencies.